TECHBRIEF

# Performance Trends of Rehabilitated AC Pavements

Publication No. FHWA-RD-00-165
FHWA Contact: Cheryl Richter, HRDI-13, (202) 493-3148

## Background

A primary objective of the Long Term Pavement Performance (LTPP) program is to develop improved design methodologies and strategies for the rehabilitation of existing pavements. One of the experiments designed to address this objective is General Pavement Study (GPS) 6.

The GPS-6 experiment, "AC Overlay of AC Pavements," involves pavement test sections where an asphalt concrete (AC) overlay was placed on an existing AC pavement. The GPS-6 experiment is further divided into two parts—GPS-6A and GPS-6B test sections. The GPS-6A part of the experiment includes those test sections for which a detailed condition survey of the existing surface was not performed prior to overlay placement. Conversely, the GPS-6B part includes those sections for which detailed distress surveys were performed prior to overlay. There are 60 GPS-6A test sections and 65 GPS-6B test sections in the LTPP program.

This TechBrief summarizes the results of a study of the GPS-6 experiment, entitled "Performance of Rehabilitated Asphalt Concrete Pavements in the LTPP Experiments—Data Collected Through February 1997." The study documents performance trends of the 125 GPS-6 test sections using distress data collected through February 1997. The test sections represent a diverse range of conditions. The age of the overlays range from 0.1 to 26.4 years (with an overall mean age of 7.3 years), while the traffic levels range from 10 to 1,900 thousand equivalent single-axle loads (KESALs) per year (with an overall mean of 300 KESALs per year).

## Distresses Considered in the Study

Six distress types or performance indicators were used to evaluate the performance trends or characteristics of the LTPP GPS-6 test sections. They include fatigue cracking, longitudinal cracking in the wheelpath, longitudinal cracking not in the wheelpath, transverse cracking, rutting, and roughness (as measured by the International Roughness Index [IRI]). The extent of these distresses was divided into different categories for relative comparisons. The different levels of distress used in the study are defined in table 1 on the following page. Table 2, also on the following page, shows the percentages of the GPS-6 test sections having nominal and greater than nominal levels of distress, respectively. As table 2 shows, more than half of the GPS-6 test sections have no fatigue cracking, longitudinal cracking in the wheelpath, or longitudinal cracking not in the wheelpath.

LTPP

The Long Term Pavement Performance (LTPP) program is a 20-year study of in-service pavements across North America. Its goal is to extend the life of highway pavements through various designs of new and rehabilitated pavement structures, using different materials and under different loads, environments, subgrade soil, and maintenance practices. LTPP was established under the Strategic Highway Research Program, and is now managed by the Federal Highway Administration.

U.S. Department of Transportation
**Federal Highway Administration**

Research, Development, and Technology
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, VA 22101-2296

### Fatigue and Longitudinal Cracking in Wheelpaths

Only 15 percent of the GPS test sections have more than a nominal level of fatigue cracking and only 10 percent have longitudinal cracking in the wheelpath greater than the nominal level. Most of the GPS test sections have performed well past 10 years of age with little fatigue cracking. The following is a summary of observations regarding the occurrence of fatigue cracking and longitudinal cracking in the wheelpath:

- The GPS-6A data show that overlay designs that provide pavement structure consistent with traffic expectations can be expected to perform well for more than 10 years.
- The study concludes that fatigue cracking and longitudinal cracking in the wheelpath are related. Specifically, the longitudinal cracking in the wheelpath will eventually propagate or evolve into fatigue cracking with continued traffic loading.

### Transverse Cracking

Thirty-five percent of the GPS-6 test sections have more than a nominal amount of transverse cracking. Although transverse cracking was found to increase with age, some overlays have survived with limited or no transverse cracking for long periods of time. The following is a list of general observations regarding the occurrence of transverse cracking:

- As the thickness of the overlay increases, the incidence of transverse cracking decreases.
- Where transverse cracking has occurred, the data show that the amount of cracking is dependent on the condition of the original pavement prior to overlay placement. The overlays placed on pavements that were classified as being in good condition exhibit about a 50-percent increase in time to the same level of transverse cracking as those overlays placed over pavements that were classified as being in poor condition.
- The age of the AC overlay was found to have an effect on the occurrence of transverse cracks for thin overlays (less than 60 mm), but no measurable effect for the thicker overlays. As the thickness of the AC layer increases, the binder and mixture properties become much more important and the age of the mix becomes less important. Although the LTPP data do not conclusively support those findings, they do not contradict them.
- While it is a widely accepted belief that transverse cracking is, to some degree, a result of low temperatures, only a moderate amount of transverse cracking occurs in the Canadian test sections, where low temperatures are common.

**Table 1.** Magnitude of distress for each category.

| Distress Type | Nominal | Moderate | Excessive |
|---|---|---|---|
| Fatigue cracking, $m^2$ | 1 - 10 | 11 - 60 | > 60 |
| Longitudinal cracking in the wheelpath, m | 1 - 50 | 51 - 160 | > 160 |
| Longitudinal cracking not in the wheelpath, m | 1 - 50 | 51 - 160 | > 160 |
| Transverse cracks, no. | 1 - 10 | 11 - 50 | > 50 |
| Rutting, mm | < 7 | 7 - 20 | > 20 |
| Roughness (IRI), m/km | < 1.6 | 1.6 - 2.4 | > 2.4 |